SPATIAL DISTRIBUTIONS OF AMERICAN KESTRELS AND LOGGERHEAD SHRIKES WINTERING SYMPATRICALLY IN EASTERN TEXAS

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American Kestrels (*Falco sparverius*) and Loggerhead Shrikes (*Lanius ludovicianus*) are facultative insectivores feeding mostly on grasshoppers. They switch to small mammals and small birds when low temperatures reduce insect activity. Both hunt primarily from exposed perches such as utility lines and poles, although kestrels scan for prey while hovering (Bent, *U.S. Nat. Mus. Bull.* 170, 1938; Bent, *U.S. Nat. Mus. Bull.* 197, 1950; Roest, *Auk* 74:1–19, 1957; Balgooyen, *Univ. Calif. Pub. Zool.* 103:1–88, 1976). Superficially, sympatric kestrels and shrikes would appear to compete for food. In this note we show that kestrels and shrikes exhibit spatial segregation.

During December 1977, we recorded the sequence of occurrence and the location to the nearest 1.6 km (1 mile) of 151 kestrels and 249 shrikes censused along a 1464-km (910-mile) automobile survey route in eastern Texas. Most of the birds were perched on utility lines when sighted (92% of kestrels; 98% of shrikes). To determine whether the numbers of individuals of each species locally were correlated, we ascertained the number of individuals of both species in each of the 91 16-km segments of the survey route. Kestrels averaged 1.66 ± 2.46 birds per 16 km and were present in 51 of the segments, and shrikes averaged 2.74 ± 3.40 individuals per 16 km and were present in 64 segments.

For both kestrels and shrikes the number of birds seen per segment was positively, though not significantly, correlated with the number of individuals of the other species present in the segment ($r = +.26$, d.f. $+ 1$, $.10 > P > .05$, for kestrels; $r = +.23$, d.f. $= 1$, $.10 > P > .05$, for shrikes). While a negative correlation between the two species per 16-km interval might indicate one species depressing numbers of the other, the positive correlation we found most likely reflects similarity in habitat selection along our rather heterogeneous survey route, and does not exclude the possibility of competitive depression.

An analysis of the sequence of kestrel and shrike sightings along the survey route revealed that in both species conspecifics tended to occur together (table 1). In 60 percent of the instances involving sequential sightings of kestrels and 83 percent of the instances involving sequential sightings of shrikes, three or more conspecifics were viewed in succession. This indicates that the clumping we saw was not simply the result of mated pairs occurring together.

Taken as a whole, these results show that while the two species did occur together, they were not randomly distributed with respect to each other. What remain to be determined are the habitat parameters along which the two species partitioned resources and whether that partitioning was affected by interspecific social dominance (sensu Morse, *Amer. Nat.* 108:813–830, 1974).

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Table 1. Statistical Analysis of the Sequence of American Kestrel and Loggerhead Shrike Sightings along a 1464-km Eastern Texas Survey Route.

Species		Followed by		P[a]
		American Kestrel	Loggerhead Shrike	
American Kestrel	observed	81	70	<.005
	expected[b]	56.8	94.2	
Loggerhead Shrike	observed	68	180	<.005
	expected	93.9	154.1	

[a]Chi-square test for goodness of fit.
[b]Based on random sequence.

BOOK REVIEWS

Animali in pericolo in Italia. 1976. Franco Pedrotti (ed.). Camerino: Italian World Wildlife Fund. 710 pp., 119 plates, 154 figures.

Little is known of Italian ecological research outside Italy itself. This volume provides an excellent opportunity to discover the high quality and professionalism of field research conducted by Italian researchers on endangered species. The Italian section of the World Wildlife Fund has financed and organized a limited number of research projects in Italy since 1967. This book contains 20 papers, most of which analyze the results of up to 10 years of field research on the small number of Italian bears, wolves, mouflons, vultures, eagles, ungulates, and frogs. Four of the papers deal with the ecology and distribution of rare animals in the Abruzzo National Park.

Eight papers deal with Italian raptors, usually reporting and analyzing the results of field studies. The first concerns the historic and present status and migration of the Egyptian Vulture (*Neophron p. percnopterus*). The author, G. Bologna, has organized a census of it in Italy from 1971 to 1976. This vulture occurs year-round in Sicily with a breeding population of 40–50 vultures. On the Italian mainland it is confined to the southern half as an uncommon summer resident (breeding population of 70–80 vultures). The species is threatened, and the author suggests strict protection and law enforcement, creation of special nature reserves around nesting areas, and the establishment of "vulture restaurants."

M. Chiavetta discusses the distribution and nest site selection of Italian Peregrine (*Falco peregrinus*) and Lanner Falcons (*F. biarmicus*). He compares the historic, present, and potential breeding density of both species in a study area, the Apennine Mountains, state of Emilia-Romagna (near Bologna). Nice drawings of cliff cross-sections and a distribution map of falcon nest sites, 1971–1974, complement this study. With a combination of personal travel (80,000 km), reports of hunters, and extrapolation techniques, he estimates the total population of the Peregrine in Italy at around 300–400 pairs